

Chapter 5 Plan Operation and Maintenance

5-1. General

Effective flood warning systems do not sit in the closet only to be pulled out when a flood strikes. Continuous operations and maintenance are essential to keep the system functional and ready when needed. Various specific elements of a flood warning - preparedness program can affect reliability. Table 5-1 identifies several of these key elements.

Table 5-1
Reliability Considerations

Category	Items
Hardware	Sensor Site Hardware <ul style="list-style-type: none"> • Sensor function/calibrations • Transmitter electronics • Battery life
	Base Station Hardware <ul style="list-style-type: none"> • Electrical power • Radio receiver • Telephone modems • Computers
	Communications Hardware <ul style="list-style-type: none"> • Telephone lines • Radio repeaters
Software	Base Station Computer <ul style="list-style-type: none"> • Data collection • Data quality control • Alarming features • Display functions • Hydrologic models
Leadership	Flood Warning Coordinator <ul style="list-style-type: none"> • Forecast procedure updates • Volunteer observer updates • Training • Drills • Documentation for volunteers
Response	Emergency Plans <ul style="list-style-type: none"> • Updates • Training • Drills

5-2. Periodic Calibration, Inspection, and Maintenance

a. Measurement systems, communication systems, and forecast systems need periodic calibrations to ensure quality performance. Rain- and stream gages must be checked routinely to ensure that they are working properly. Plugged raingages, jammed stream gages, broken antennas, and dead batteries degrade system performance. Frequent maintenance

checks are required to ensure that the system operates properly during an emergency.

b. All system sensors need periodic calibrations to ensure high quality data recovery. Raingage tipping buckets and stream gage sensors, particularly pressure transducers, can drift from their nominal calibrations.

c. Radio systems must be checked and retuned periodically to satisfy regulations of the Federal Communications Commission. In addition, should radio transmitters drift off frequency, data recovery declines.

d. Hydrologic models require periodic adjustments to reflect knowledge gained by experiencing new storms. Frequently, new flood warning systems do not have adequate data to calibrate the hydrologic models properly. Each new storm provides information to refine hydrologic model parameter estimates. In the early years of a flood warning system, calibrations should be reviewed annually and after each significant event.

e. Ongoing inspection, maintenance, and replacement are essential. Floods are aperiodic. Major floods are infrequent and anything but routine. Keeping the system well maintained to achieve optimal system performance when the unexpected flood does occur is critical.

5-3. Revisions and Enhancements

Technologies are constantly evolving into tools that can improve system performance. Advances in electronic components are specific cases in point. New components are smaller, faster, and cheaper to make. In some cases, technologies are changing so rapidly that obsolete equipment can become a critical concern - especially if the rate that equipment becomes obsolete is higher than a community's capacity to replace it.

5-4. Training

a. On-going training is vital to overall system performance. Personnel and technology change, and enhanced versions of components and/or software become available. Also, interagency relationships and responsibilities change over time, making on-going training and "situational awareness" essential.

b. Specifically, on-going training is essential for:

- Operation and maintenance of field equipment (electronics, sensors, and radios)
- Operation and maintenance of communications links

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- Operation and maintenance of computer software
- Interpretation of hydrologic data and forecasts
- Emergency operations
- Forecast and warning dissemination equipment